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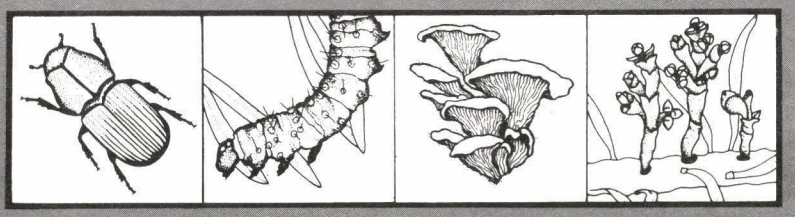

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MOUNTAIN PINE BEETLE: A LAND MANAGER'S PERSPECTIVE

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INTRODUCTION

In anticipation of an imminent mountain pine beetle epidemic, a land manager must establish an effective management strategy to limit the adverse effects of such an outbreak. Assessing the magnitude of a potential infestation, the manager must relate those impacts to the management objectives for the land under consideration.

Prior to implementing a course of action, the land manager must comprehensively analyze the resources involved. The Swan Lake Ranger District, Flathead National Forest, was faced with such a task in 1982. A beetle outbreak was expected as part of a wide-scale infestation spreading throughout adjacent Ranger Districts and private lands. Following a Forest-wide study completed in 1979, the Swan Lake District's analysis of the management situation included the following:

1. Identification of land management objective

2. Review of the location and distribution of lodgepole pine from the existing timber inventory

3. An assessment of mortality that could be expected should an epidemic occur

4. A review of the current literature and management options available to respond to mountain pine beetle infestations in lodgepole pine stands.

Once management objectives have been identified, effects of a large-scale epidemic must be analyzed in relation to resources involved. Potential losses to the timber resource can be effectively analyzed using existing timber inventories and the Rate of Loss Model (Cole and McGregor 1983) that has been integrated with the INDIDS analysis program (Bousfield et al. 1985). This model simulates mortality trends in lodgepole pine stands during a 10-year epidemic period. Once mortality is estimated for all lodgepole pine stands in an analysis area, the stands can be prioritized for treatment based on relative levels of predicted loss.

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During this stage of the analysis, a review of current literature and past management activities is critical in developing a successful strategy to respond to a mountain pine beetle infestation. One significant option that has been used (as documented on the Deschutes National Forest in Oregon) is sanitation-thinning (Mitchell et al. 1983; Pitman et al. 1982; Schmitz et al. 1981; Znerold 1985). Wisely used, this silvicultural tool can be combined with other alternatives to develop a timely, effective management strategy.

ANALYSIS ON SWAN LAKE RANGER DISTRICT

In 1984, sanitation-thinning was used on the Swan Lake Ranger District to reduce potential losses to a pending mountain pine beetle infestation. In a pure stand of 100-year-old lodgepole pine, the basal area of 150-160 square feet per acre was reduced by thinning from below to 80-100 square feet per acre. Crop trees remaining were generally greater than 9 inches d.b.h. (diameter at breast height), had a live crown ratio greater than 30 percent, and were in the dominant or codominant crown class. These were the most vigorous trees in the stand with the greatest potential for thinning response. During the first two beetle flight seasons following treatment, beetle-caused mortality has been minor within the thinning units. At the same time, adjacent uncut stands have lost up to 88 percent of their lodgepole pine component (Gene Newell, personal communication).

The relationship between thinning and low-level beetle activity is also evident when older thinning treatments are evaluated. Thinnings completed in lodgepole pine as long as 20 years ago were reviewed during 1984 and 1985. Stands were thinned through a series of post and pole sales. All trees less than 7 inches d.b.h. had been removed, leaving a current basal area of approximately 80-100 square feet per acre. Crop trees remaining were greater than 8 inches d.b.h. and over 80 years old. Field reviews indicated very low levels of mortality in the crop trees. Adjacent unthinned stands experienced high levels of mortality.

This technique, however, is not without economic impact. An economic analysis was completed for a portion of the Swan Lake District, in which approximately 3,000 acres of mature lodgepole pine were evaluated for harvest. Among the alternatives considered were:

1. Complete regeneration harvest

2. A mix of 50 percent thinning, 50 percent clearcut harvest

3. Defer harvest.

The economic analysis showed a long-term net present worth of $306 per acre, $284 per acre, and a negative $146 per acre, respectively. Additional costs involved for the thinning alternative were for marking the stands, higher logging costs, and the cost of delaying a regeneration cut. Lodgepole pine sales sold on the District during 1985 and 1986, including a mix of thinning and regeneration harvest units, were purchased for $45-$55 per thousand board feet (MBF). During the same period, lodgepole pine sales with no thinnings sold for $60-$70/MBF. The manager may be willing to accept these additional costs if in so doing other resource management objectives for the analysis area can be met.

Due to the current distribution of mature lodgepole pine in stands of 500 to 2,000 acres, the management option of regeneration harvest alone cannot always be realized if other resource objectives are to be met. Some of the resource objectives which can be met through a mix of management options are (1) water quality in critical watersheds; (2) sensitive wildlife habitat; and (3) sensitive visual areas. Depending on the size and juxtaposition of regeneration cutting and sanitation-thinning treatments, many of the problems associated with wide-scale regeneration harvests can be reduced. In particularly sensitive areas where other resource objectives are important, a reduced level of regeneration harvests may be the only way the land manager can maintain other resource objectives at a desirable level. When this situation occurs, the management option of sanitation-thinning can be useful in removing green lodgepole pine prior to beetle infestation. By protecting, or "beetle-proofing," a significant portion of the stand, it is reserved for future harvests.

Protecting the remaining stand can also increase overall wildlife habitat by creating better age class diversity. As a result, in a local area significant amounts of hiding cover for wildlife remain. The advantage intermediate harvesting gives the land manager, in terms of diversifying age classes, is especially important to the maintenance of long-term habitat quality for cover and forage. At the same time, the timber resource is benefitted by creating a more diverse, vigorous forest--one that should be less susceptible to mountain pine beetle infestations in the future. A mix of regeneration harvests and thinning can also reduce potentially adverse visual impacts from middle and background viewing. While increases in water yield cannot be totally eliminated by utilizing a mix of regeneration harvests and thinning, yields can be reduced enough in critical areas (as compared with wide-scale regeneration harvests or extensive beetle-caused mortality) to protect water quality.

RESOURCE CONSIDERATIONS

If the alternative of sanitation-thinning is going to be used in the overall management strategy, the land manager must choose stands where this technique will be most successful. A list of site attributes and considerations to use when evaluating a lodgepole pine stand for sanitation-thinning has been developed (Bollenbacher 1985):

1. Site productivity: A favorable soil/moisture regime will likely add to the probability of an increase in growth and vigor of the crop trees.

2. Slope: Generally treat stands on tractor ground less than 35 percent to limit residual stand damage.

3. Average stand diameter: Choose stands where average d.b.h. exceeds 9 inches with less than 350 trees over 5 inches d.b.h. per acre. These stands will be more economical to log and will receive less residual stand damage.

4. Age: Consider stands that are greater than 60 and less than 125 years old.

5. Current basal area: Stands should have at least 130 square feet per acre to be an economical logging chance.

6. Elevation: Consider only those stands lower than 6,000 feet. Stands at higher elevation (in northwest Montana) are generally lower risk due to a shorter growing season.

7. Wind firmness: In relation to topography, choose the most sheltered slope positions, as identified by Alexander (1975).

8. Present beetle infestation rate: Choose stands with a present infestation rate of 10 percent or less. Higher levels may result in excessive mortality in leave trees if logging is not completed prior to the next beetle flight.

9. Tree vigor: Choose stands with crop trees having a live crown ratio of 30 percent or greater.

10. Other resource objectives: Consider only those stands where other resource objectives may not be met through regeneration harvesting.

SUMMARY

In summary, the land manager has an extremely complex task when faced with an imminent mountain pine beetle epidemic. Land management objectives for the area involved must be identified. Magnitude of predicted loss of mature lodgepole pine volume must be located and assessed. Finally, all possible strategies available to aid in the development of an effective management strategy must be reviewed. Only in this way will one best be able to respond to the potential of an outbreak while at the same time effectively meeting land management objectives.

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